

# Key Learning Theories in Mathematics Education

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My teaching philosophy embodies four distinct teaching theories: the ARCS Model of Motivational Design, experiential learning, discovery learning, and humanism. The following will summarize these four theories, and suggest why they are useful in the field of mathematics instruction.

## ARCS MODEL OF MOTIVATIONAL DESIGN

The ARCS model of motivational design suggests that attention, relevance, confidence, and satisfaction are all key components in promoting and sustaining motivation in the learning process. As an educator, I enjoy incorporating unexpected elements into my lessons to grab my students' attention. For example, I began a lesson in a grade 10 quadratics unit with a short clip from the Transformers movie, highlighting the transformation of Optimus Prime from robot to truck. That certainly grabbed my students' attention. Then I asked them why I would have shown them this clip, and a student yelled out "Transformations of Quadratics!" Sometimes, using a few minutes of class time to grab my students' attention can have a very profound effect. Similarly, I have found great success in math instruction through competitive and collaborative games, which motivate students and encourage positive social interactions and active engagement in learning. In addition, attention can be gained through discovery or experiential learning, which will be discussed below. In order to increase student motivation, the content of the course must be made relevant to their own lives. In mathematics education, this is of particular importance because students are always asking why they need to be learning the content. Students need to understand why they are learning the current material and how it will help them today, as well as in the future. One of my greatest strengths as a teacher is to enhance the confidence of the individual students in my class. I spend one-on-one time with my students and then have them answer questions during class discussions that I know they are able to answer. When students are unsure or nervous, I guide them through the problem so that they are able to successfully answer the question. And by doing this, I give my students the opportunity to feel success in the classroom, which for many students in mathematics, is a very rare occurrence. Satisfaction is the final key component in the ARCS model of motivational design. By providing students with fair evaluations, we give them the opportunity to use their knowledge and hopefully, achieve satisfaction based on their results.

## EXPERIENTIAL LEARNING

Experiential learning refers to the process of learning through doing. When properly executed, and used in conjunction with reflection and feedback, experiential learning can result in a better understanding and retention of the new knowledge acquired. While this process may have profound effects, in my perception it is rarely employed in mathematics education. However, I feel that experiential learning can play a great role in this field, especially since there all too often seems to be a general disconnect between the curriculum and the real world. For example, in secondary school, one of the most relevant math units to real life is the finance unit, where students learn how to calculate simple and complex interest, present and future values and monthly payments of annuities. These concepts are so important and yet, students are often taught to simply plug in numbers into formulas and find the unknown value. There is often no real understanding of the math concepts. Instead, students can be given experiential learning opportunities related to finance, perhaps through charitable fundraising, for example.

## DISCOVERY LEARNING

Discovery learning utilizes inquiry and problem solving to draw on past experiences and existing knowledge to form new discoveries. Through exploration and experimentation, students may be more likely to acquire and retain knowledge. In mathematics education, I have found that using guided discovery, questioning, and problem-based learning leads to higher engagement and promotes a shift from passive to active learning.

One example of where I have used discovery learning in my own teaching is when I introduced the trigonometry unit in grade 10 mathematics; I had my students brainstorm to determine what properties need to exist in order to deduce the two triangles were either congruent or similar. I found this to be much more effective than simply telling the students what the conditions to prove congruency or similarity were. Students were engaged and motivated, and had an opportunity to exercise their autonomy while developing their creativity and problem solving skills. Additionally, using discovery learning approaches helps tailor the learning experience to suit the needs of the individual learners in the class.

## HUMANISM

Humanism views learning as a personal act to fulfil one's potential, and stresses the importance of the development of strong, positive relationships with and among students. The role of the educator is to enable their students by providing them with appropriate resources, and encourage them to achieve high order learning. According to this theory, learning combines logic and intellect with intuition and emotions. As a teacher, I believe it is important to recognize the impact not only of a student's intellect on their learning, but also take into consideration the role that their feelings play in dictating how and what they learn. Thus, building positive relationships with my students allows me to gain a better understanding of where they are coming from, and what resources or strategies may be used to effectively enhance their learning.



Below is a visual representation of the four learning theories discussed. It embodies some of the key characteristics of these theories including attention (Optimus Prime), confidence (man and mirror), experience (hand), discovery (light bulb), and relationships and humanism (mother and child).

